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Dynamic transformation and retransformation during the simulated plate rolling of an X-70 steel

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ABSTRACT

A seven-pass rolling schedule was simulated on the McGill hot torsion machine. The first and last pass temperatures were 950 and 860°C with 15° of cooling between passes. All of the rolling was carried out above the Ae3 temperature of 845°C that applies to this composition. Interpass times of 10 and 30 s were employed, which corresponded to cooling rates of 1.5 and 0.5°C/s, respectively. Samples were quenched before and after the first, third, fifth, and seventh passes in order to determine the amount of dynamic ferrite produced in a given pass. The data also allowed for estimation of the amounts of ferrite that retransformed to austenite during the holding period. The volume fractions of ferrite and martensite (prior austenite) were determined by optical metallography. The amounts of dynamic ferrite formed increased with pass number, averaging about 13 and 10% per pass for the 10- and 30-s schedules, respectively. The amounts of retransformed ferrite also increased with pass number, averaging about 7% for both interpass times. The effect of employing longer holding intervals above the Ae3 after finish rolling to permit more retransformation is also discussed.